DOCUMENT RESUME

ED 178 087 IR 007 836

AUTHOR Everett, Richard J.
TITLE A Comparative Analysis of Student Learning in the Affective Domain from Color and Black and White Mediated Instruction and the Maturation Level of the Student.
PUB DATE Aug 78
NOTE 115p.; Master's Thesis, University of Calgary; Appendix B "Plates of slides from the study" was removed prior to filming because of poor reproducibility

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Affective Behavior; Attitudes; *Color Presentation; Educational Research; Elementary School Students; High School Students; *Intermode Differences; Maturation; *Slides; *Visual Perception
IDENTIFIERS *Black And White Presentations; Canada

ABSTRACT

This study compares the effects of black and white and color mediated content on pupil's affective responses at different levels of maturation for 148 students in grades four, seven and 12 of the Calgary Public School System. Students in each treatment group were shown a set of 14 identical slides in either black and white or color and told to record their affective responses to each slide on a set of ten semantic differential scales which expressed affective feeling on the evaluation, potency, activity, and color dimensions. They were told to evaluate slides according to how strongly or weakly the affective content made them feel in relation to each set of scales. Findings revealed that students of an earlier level of maturation react at a more impulsive level of feeling than students at a later level. Treatment (black and white or color) has an effect on affective responses in the evaluation, potency, activity, and color dimension. The affective content of a slide affects the direction in which responses will be recorded, but the absence or addition of color affects the degree of appraisal. (Author)

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A COMPARATIVE ANALYSIS OF STUDENT LEARNING IN THE AFFECTIVE DOMAIN FROM COLOR AND BLACK AND WHITE MEDIATED INSTRUCTION AND THE MATURATION LEVEL OF THE STUDENT

by

RICHARD J. EVERETT

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF MASTER OF ARTS

DEPARTMENT OF CURRICULUM AND INSTRUCTION

CALGARY, ALBERTA

AUGUST, 1978

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "A COMPARATIVE ANALYSIS OF STUDENT LEARNING IN THE AFFECTIVE DOMAIN FROM COLOR AND BLACK AND WHITE MEDIATED INSTRUCTION AND THE MATURATION LEVEL OF THE STUDENT" submitted by Richard J. Everett in partial fulfillment of the requirements for the degree of Master of Arts.

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ABSTRACT

The purpose of this study was to compare the effects of black and white with color mediated content on pupils' affective responses at different levels of maturation.

Results from one hundred and forty-eight students in grades four, seven and 12 of the Calgary Public School System, were analyzed. Subjects were assigned to either a black and white or color treatment group. Data were compiled into male and female ratings within each of the treatment groups. This resulted in a two by two by three factoral design.

Students in each treatment group were shown a set of 14 identical slides in either black and white or color. Subjects recorded affective responses to each slide on a set of ten semantic differential scales which expressed affective feeling on the evaluation, potency, activity and color dimensions. Students were given initial instruction regarding registration of responses on the semantic differential scales. They were told to evaluate slides according to how strongly or weakly the affective content made them feel in relationship to each set of scales. Each slide in each treatment was shown for 45 seconds during which time the subjects recorded their affective responses. Prior to viewing the slides, all students were administered a color blindness test to check for deficiencies which might confound the results. None were

encountered.

Results were accepted as significant at alpha .05 although trends at the .1 level were also explored. Major findings in the study revealed that students of an earlier level of maturation react at a more impulsive level of feeling than students at a later level of maturation. Treatment (black and white or color) has an effect on affective responses in the evaluation, potency, activity and color dimension. The use of color increases evaluation ratings at grade four, and decreases activity and potency ratings at all levels. Color also increases the tendency to rate slides red on the color dimension. The affective content of a slide affects the direction (whether positive or negative) in which responses will be recorded, but the absence or addition of color affects the degree of appraisal. Color has a greater effect on positive slides and black and white has a greater effect on negative slides. Characteristics of evaluation for different levels of maturation were also recorded.

Conclusions therefore revealed definite difference in the responses of students at different maturation levels to color and black and white affective mediated instruction. These findings have important implications for educators.

ACKNOWLEDGEMENTS

The writer expresses thanks to his advisor, Dr. William Winn, for invaluable assistance and advice throughout the study.

Appreciation is also expressed to Dr. H. M. Diemert and Dr. R. A. Fiordo for their advice and careful consideration of the manuscript.

Thanks is also extended to Jean Vanderlee and the Calgary Board of Education for their assistance and co-operation in facilitating this study, and to staff and students of Central Memorial High School, A. E. Cross Junior High, Killarney Elementary and Sir James Lougheed Elementary for their assistance and participation in the study.

Special thanks is also extended to my wife, Sandra, for her assistance in proofreading, editing and typing the final manuscript, and to my daughter, Michelle, for her help in the initial selection of slides.

This thesis is dedicated to my daughters, Michelle and Cheralyn; that education may enhance their free spirits and vibrance ...

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Chapter 1

The Purpose and Significance of the Study

THE PROBLEM

Introduction

Perception of the world as a colorless void is difficult, since color is a facet of daily life. Yet educational designers and researchers of mediated instruction, whether it be print, film, or electronic media, have only skimmed the surface in research and design relating to the effects of this powerful medium on the student through the learning process. Many designers have concentrated their efforts on the cheapest way to produce instruction while researchers have continually stressed the cognitive effects of this instruction. Hence, the affective aspects of instruction have been granted a lesser degree of importance in the learning process. This author feels that the physiological and the psychological powers of color have been highly underrated. An analysis of current cognitive research has shown that the affective factors found in these studies were largely overlooked, with few inferences made from findings that students preferred color media over black and white.

Therefore,this author's intention was to explore student reaction to the affective qualities of mediated instruction as opposed to a study on cognitive processes that have taken place. Guidelines and theories

relating to learning cannot be complete unless the whole spectrum of learning in both the cognitive and affective domains is understood.

Research relating to the affective domain appeared very limited, along with the added factor of unproven research methodology. Accurate measurement of feelings appeared difficult and may have been a major factor for this lack of research. Early studies were primarily concerned with cognitive learning, with affective findings being secondary in significance. Recent studies in affective areas such as that by Booth and Miller (1974) compared two entirely different media, color movies and black and white television, therefore decreasing the credibility of their work. All known affective studies to date have overlooked the important factor of color blindness, which may have affected the results of previous studies. The reliability of chosen instruments could also be questioned. This author's contention was that all of these factors must be dealt with if affective research is to be meaningful.

Another factor which appeared in recent studies but was apparently overlooked was the maturation level of the child. Significant differences appeared in test scores of subjects of different age levels but no inferences were made from these findings. Maturation may be of prime importance in the understanding of the learning process and the effects media may have upon people.

Statement of the Problem

Recent cognitive research on color versus black and white

instruction has found that the use of color itself does not significantly affect the cognitive tasks applicable to instruction. Only when color is used for a specific purpose, such as for a cueing device (Dwyer, 1976) or for realism (Spangenberg, 1976) does the cognitive use add any real enrichment to the learning process. Katzman and Nyenhuis (1972) have further noted that color can add too much information, therefore interfering with the learning tasks. While these findings are highly relevant to the use of color or black and white pictures, they totally ignore the fact that the student's initially affective reaction to the material may have implications relating to the learning that occurs. Research relating to affective meaning is important due to its increasing emphasis in curricula of subjects such as English, the Arts, Visual Communication and Social Studies.

The above review therefore reinforces the fact that the following considerations must be dealt with in this and future studies on affective learning.

1. Learning takes place in all domains simultaneously.
2. Much content involves major affective responses as well as cognitive thought processes.
3. Past research has shown that students prefer color to black and white media.
4. Affective research has been extremely limited and needs to be explored further.
5. Initial student reaction to content is a factor in the

learning process, and may affect the cognitive responses which follow.

6. Maturation may be an important factor in the use of color and black and white media.

The problem was therefore concentrated in two major areas of study. Firstly, student reaction in the affective domain must be rigorously explored. Secondly, stringent precautions must be taken in order to validate the reliability of the materials and the instrument used in the study. This study accounted for the above factors by taking a stringent approach to the selection of test materials. Proven rating scales by Osgood, Tannenbaum and Suchi (1962) were chosen for their high reliability coefficients. A previous procedure used by Winn and Everett (1978) was improved and modified to eliminate its shortcomings. Semantic differential scales used in the preliminary study were changed to ones of higher reliability. The medium of black and white and color slides was continued, but careful pre-screening as well as more stringent testing procedures on the slides were implemented. (It must be noted that, even with careful pre-screening, there were still individual differences in the ratings of slides.) All the subjects in the study were pre-tested for suitability by use of the Ishihara Color Blindness Test (1976). Response time to the slides was increased to 45 seconds, due to missed scores on the preliminary study. The grade levels of four, seven and 12 were tested to explore the maturation dimension of learning.

An added dimension to this study was the use of abstract content. This author felt that the affective qualities exhibited by content rather than the color in slides in the Winn and Everett (1978) study could have influenced the results. Content selection in both modes was therefore necessary to test whether subject matter was the major factor rather than the panchromatic color effects.

Hypotheses

In order to investigate the effects of colored and black and white slides on grade four, seven and 12 students due to the color medium and maturation, the following hypotheses were explored. An alpha level of $p < .05$ was set for rejection of the null hypothesis.

H1: There will be significant differences among test scores of students in the group, sex and treatment dimensions at the grade four, grade seven and grade 12 levels, who have viewed the same highly loaded affective content slides in either the black and white or the color medium.

H2: A comparative analysis of students' affective response scores to black and white and color media will show significant differences due to treatment between the color and black and white medium used.

Definition of Terms

To add clarity to this study a number of terms require definition :

Media: The term media in this paper is used in its broadest sense, from print, to film, to electronic modes unless specified by the actual mode used.

Cognitive Domain: The meaning of this term is taken from Taxonomy of Educational Objectives (Bloom, Engelhart, Furst, Hill and Krathwohl, 1956). The cognitive domain includes those objectives which deal with the recall or recognition of knowledge and the development of intellectual abilities and skills.

Affective Domain: This term as described by Krathwohl, Bloom and Masia (1964) relates to objectives which describe changes in interest, attitudes, and values, and the development of appreciations and adequate adjustment.

Color: The use of the term color refers to media which utilizes the full chromatic range of hues in the spectrum. This term is not meant to define only single color entities, but also media with panchromatic qualities.

Black and White: The term black and white refers to media which have a full range of tonal gradations from black to white but have no breakdown of white light into the full aberration of tones found in it.

Abstract Content: This is subject matter which cannot be immediately identified as recognizable objects.

Concrete Content: This is subject matter which is immediately recognizable to the learner.

Abstract Evaluation, Potency, Activity, Color: These terms refer to total scores of the abstract slides in the study (one, three, six, eight, 11, 12, 14) in each dimension of the study.

Concrete Evaluation, Potency, Activity, Color: These terms refer to total scores of the concrete slides in the study (two, four, five, seven, nine, ten, 13) in each dimension of the study.

Independent and Dependent Variables: The three independent variables identified in the study were:

1. Sex: male and female
2. Group: Grade four, Grade seven, Grade 12
3. Treatment: black and white or color slides

There were four dependent variables: evaluation, potency, activity, and color. All dimensions were rated on semantic differential scales by each subject. Vocabulary of the scales chosen was at the grade four comprehension level.

Significance of the Study

A thorough analysis of the relationship of the learning process and mediated instruction by researchers has so far been limited. This study was designed to explore the importance of affective learning as a complement to the increasing body of research on cognitive thought processes.

Studies by Booth and Miller (1976), Dwyer (1971), Vandermeer (1953), and Katzman and Nyenhuis (1972) have all shown the "like" aspect of student response to color and black and white materials, but no other studies have explored the effects of the maturation level of the students observing the content. This treatise explores the maturation aspect from two levels, those of age and sex. The sex factor was included because of previous studies which have shown that maturation of females occurs earlier than that of males. There should therefore be differences in mean scores of males and females if the hypotheses of this study are supported.

This study attempted to investigate the maturation hypothesis by comparing the test scores of students from three distinct levels of maturation: Grade four, Grade seven and Grade 12.

Another significant feature of the experiment was the "purification" of the slides so that affective dimensions of color itself could be tested against the concrete affective material in slides of previous research.

Limitations of the Study

A major fact in a subject's response to affective content is his/her socialization and earlier experiences. Difficulties would arise when devising an instrument to measure responses and the reasons for each response. The exclusions of persons of different cultural background whose responses may affect the results would also be difficult. This problem does not appear to be significant enough to

affect the results of the study. The generalizing of results of the study is limited by several factors:

1. The subjects were not randomly assigned, but instead were directly assigned by the Calgary Board of Education.
2. The sample size was small due to limitations of class size also as a result of direct assignment by the Calgary Board of Education.
3. Subjects were tested in class groups;thus there was no randomization of treatment in classes.

Chapter 2

THEORETICAL BACKGROUND AND REVIEW OF THE LITERATURE

What factors in media are responsible for eliciting emotional responses from a child? Is it the content, or is it merely the mode by which the content is presented? Is it that the material was presented in color or black and white? Perhaps it is none of the above, but rather an innate component of maturation. Educational researchers have begun to search for the answers to these questions. Cognitive processes, while important, are only a part of the child's reaction to the stimulus presented in instruction. Therefore a review of current research related to media must be made in both the cognitive and affective domains to construct a solid basis for research in this field.

Cognitive Research

The research presented in this thesis explored only those studies relating to the color versus black and white category. The general concensus in cognitive research on this issue was that pupils appear to learn cognitive content just as well from either medium, except when color was used for a specific purpose such as a cueing device or to create realism.

Dwyer (1976) found that color, when used as a cueing device was an important factor in learning. His research centered around student

interpretation of various drawings of the heart; in line, detailed line, and photographic models in both black and white and color. The findings noted that color used as a cueing device eliminated "noise" in the picture and therefore clarified the information to be learned. Secondly, the students preferred to view the colored drawings over the black and white pictures. One major fault in the Dwyer study was the fact that the color reproduction of the heart from color photographs was so poor that the results would have to favor the simplified line drawings over the complex and ill defined photography of the heart.

Earlier researchers, Maclean (1930), Ibison (1952) and Rudsill (1952) supported the notion that students prefer color over black and white but they still looked only at this factor in terms of learning the cognitive content. Jones (1964), Hensen(1973) and Spangenberg (1976) agreedwith Dwyer (1976) that color can be an important cueing device, but argued that color, when in panchromatic form, often adds too much information to the cognitive tasks to be learned.

Lamberski (1975) found that the use of color does not significantly affect test scores. His work was aimed at testing the effect of the difference between two types of cueing (color and black and white) found in simple line drawings on immediate and delayed retention tests. He also tested the effectiveness of either medium and checked alteration of achievement due to conditioned visual cueing patterns. While this author finds Lamberski's study interesting,it can be criticized

because of the instruments used to test his hypotheses. He used a set of various colored diazo overlays and a corresponding set of black and white overlays, illustrating the specific location and spelling of words. His study found no differences in the use of color as a cueing device. The content of the diazo overlays depicted simple line drawings of the various components of a video recorder system. Parts of the system to be reinforced in each diazo were isolated from the background by shaded areas in either color or black and white, depending on the treatment group. Obviously, the relevance of this study breaks down with the use of this material. The content to be learned was in simple line drawings in black and white. The color factor did not reinforce the content to be learned, but rather screened out content not to be considered. The subjects in both treatment groups were relating to the non-shaded areas (black and white line drawings) thereby creating a condition where the content to be learned was identical in both treatments. Winn and Schieman (1977) have shown that university students are more concerned with the "thing" character of an object rather than with its color unless the subjects were told specifically to pay attention to the color factor. This could explain why Lamberski found no significant differences when using color in this manner. In view of these weaknesses, it is probable that the cueing device theory of color is still a factor in cognitive learning.

Katzman and Nyenhuis (1972) did a study on "Color versus Black-

and-White Effects on Learning, Opinion and Attention". This study was primarily cognitive, but did explore affective factors. Slides were the medium for conducting their experiments with cognitive content from the advertising field. The study arrived at the following significant findings.

1. More events both "relevant" and "irrelevant" were remembered from the color presentations.

2. Additional visual cues, such as those provided by a line presentation or the addition of color, may tend to increase recall of peripheral material. It is suggested that the underlying factor was the appeal and realism of the color presentation.

3. People (when given the option) tend to view color material longer than black and white.

All scores were taken by recording the amount of time subjects chose to view black and white or color treatments. Subjects changed each slide with a remote control slide advancer. The subjects were given a mimeographed questionnaire. Items one to six were seven-point semantic differential scales measuring various dimensions of feeling. The rest of the questions consisted of multiple choice recall items related to materials from slides which had been taken from a comic book story. An interesting note in this study was that no significant differences were found on verbal centered, verbal-peripheral, or non-verbal-peripheral items on the colored treatment. All subjects in the study were undergraduates. Link (1961) and Spangenberg (1976) agreed that students like color better, but also noted that there was no reliable

difference in performance unless color was used as a cueing or coding device. This research did not establish any relationship between cognitive and affective responses.

Another area of research on the use of color to assist learning concerns color perception. Chen (1971) centered his research on visual deficiencies. He noted that color may affect the subject by the way it is used. Factors such as hue, contrast, and illumination intensity all have an effect on an individual's reaction to instruction. He found that too much emphasis was given to aesthetic qualities of color rather than to perceptual importance. This applies especially to people with color deficiencies.

Richards and Macklin (1971) were concerned with the effect of color on gain of contrast and seeing loss. Their major finding concluded that color is only 35% as bright as black and white and that students took four times longer viewing color than black and white. A fault of this study is that there was no indication whether this longer viewing time was due to the illumination or the preference for color. Snowberg (1973) was concerned with color of background and found that white was best for visual acuity and blue was the least acceptable where critical legibility was a factor.

Apparently there are many factors which deserve consideration when color is used to aid cognition. Cognitive studies revealed:

1. Little difference in cognitive learning from either black and white or color media.

2. Color could be effective when used as a cueing device.

3. Students liked color presentations better than black and white.

4. Other factors related to perception and visual deficiencies must be considered when presentations are designed in color.

A disturbing factor about the above studies was that no researchers reported testing the subjects for color blindness. Furthermore, the affective factors which kept reappearing in these studies were relegated to a secondary position in the findings. Few inferences were made relating the affective findings of these studies to the cognitive tasks to be learned.

Affective Research

Dwyer (1971), in earlier research using illustrations of the heart, agreed with Birren (1959), that color influenced the learner psychologically and physiologically. He noted that color was capable of arousing definite emotional and aesthetic reactions. One of the earlier researchers on color and black and white, Vandermeer (1953), noted that color may be pleasing to the learner and its aesthetic appeal may have an indirect effect in promoting greater learning, even if the color proved neither important for cues or emphasis. He concluded that there was a positive relationship between the extent of the "liking" that a group of learners indicated for a given film and the amount learned from the film. His research indicated that "liking" was directly related to color.

Researchers in advertising have found that color has a definite effect on the consumer. Findings generally note the increase of appeal of color advertisements, listing greater liking, more attraction and greater recall over black and white. Gardner and Cohen (1966), Starch (1966), Gattegno (1963), Lucus and Butt (1950), also noted that full color advertisements were 45%-85% more effective than black and white. An important aspect of the advertising research is the fact that the studies were only concerned with the affective feelings of the consumer.

The study by Lucus and Butt (1950) noted differences in male and female respondents. They discovered that women appeared more responsive to color than men. Another finding was that people often related to color in hues of reddish, yellowish, bluish, or greenish, rather than in strong, pure hues. Another finding indicated that reaction to color was related to previous emotional experiences regarding certain colors. Adams (1920) discovered that the attention value of colors could be arranged in the following order: orange, red, blue, black, green, yellow, violet, and grey. Burtt's (1938) research indicated individual preferences for certain colors. His studies found that blue was ranked higher by men, black and grey ranked lowest with women. Ten of his studies placed yellow and orange last. These studies noted that responses to the colors red and green were erratic, escaping only the last place in rankings.

Lucus and Butt (1950) also found that the realism of color, "its vividness, intensity, and possibly its pleasant effects, all aid in retention and in later recall". Carter, Vredenberg and Patty (1967), and Patty and Vredenberg (1970) found color helped to attract initial attention but that recognition was difficult if too many colors were used. Hinds and Dodds(1968) indicated that the use of color reinforces both the auditory and visual images of words as well as simultaneously holding attention of the learner.

A study by Birren (1973) supported the view that personality was related to perception of color. He found that children whose personalities exhibited more affective qualities preferred warmer colors and older persons and the more reserved personalities preferred cooler shades. A liking for color was associated with extroversion and indifference to color with introversion. While the above advertising research was not directly related to education, it could be concluded that color does have a bearing on affective responses, primarily in terms of a person's psychological and physiological reactions and increased recall. Research by Birren (1969) emphasized the psychological facets of color. He wrote that color effects were generally in two directions — toward red and blue. These two major colors induced different levels of activity both in the autonomic nervous system and in the brain. Red had an exciting influence whereas blue colors lessened activity. This reaction to color was in the subconscious. Robert Gerard (1958) found

that color had an effect on "affective responses". These responses were based upon personal experiences, judgements and feelings. He discovered that red was "somewhat disturbing to the more anxious subjects". In fact, "the higher the chronic tension, the more they were affected physiologically by red". At the opposite end of the spectrum, using blue, Gerard noted the reverse effects as the anxious subjects were relaxed and calmed by this color. These findings appear to have implications for both affective content and the state of the subject when viewing cognitive material.

Birren (1969) noted that red and other "warm" colors were related to excitement whereas blue and other "cool" colors had the reverse effect. Winn and Everett (1978) used the red-blue dimension in a study on the differences of the affective meaning of color and black and white pictures. Their study found significant correlations between red-blue scores and activity with the red being more active. Another interesting finding was that red slides were rated "good". Red-rated slides were always more active than black and white duplicates. This gain may have been a result of red and blue being an expression of feeling even when relating to the black and white slides, as well as the possibility that the students identified with the color qualities of these slides, eg. whether the slide was predominately warm or cold in color.

Booth and Miller (1974) were among the first educational researchers to explore the effects of color and black and white on affective

learning. Their findings indicated that:

1. Students would rather view color than black and white.

2. Prior years of monochromatic (black and white television) viewing had no effect on the students' perception of color viewing.

3. Pupils in grade two appeared to show more internalization toward positive attitudes when viewing monochrome.

4. Pupils in grade two and grade six had apparently employed more processes leading to ideation, or imagination when viewing monochrome than their counterparts who had viewed color.

5. Pupils in grade four appeared to be in a transitional state and the data allowed no conclusions.

6. The color variable may be a positive factor in promoting levels of valuing in grade six.

(It should be noted that the Booth and Miller study incorrectly used the term monochrome, when they in fact meant black and white.)

Winn and Everett (1978) found an interesting factor that may shed some light on the Booth and Miller (1974) study. They gathered data from a population of university undergraduates and from subjects at the junior high level. In all instances, university subjects rated the material more positive on the evaluation dimension of a semantic differential than the junior high subjects. This lead to the assumption that affective perception of color may be directly related to the maturation process. A study by Miller (1976) added further support for this assumption. He was concerned with the cognitive effects of color and black and white presentations. He found that there were no significant differences at the second grade level in the acquisition of cognitive

information gained from color and black and white presentations and that fourth grade pupils performed better on the post-test after watching color presentations. He concluded that color was not cost effective at grade two, but was at grade four. This finding also appeared to lend credibility to the theory that affective reaction to color may have been related to the maturation level of the student. Further support was added by advertising research. All studies dealt with subjects of post-secondary age and beyond. The findings of greater appreciation and better recall may in fact be due to the maturity of the subjects.

A new area of research carried out by Sylwester (1978) added further reinforcement to the maturation theory. His research and review of medical studies showed that the child develops his mental capacities at different age levels. Boys have been found to operate at the cognitive level up to six years when the brain functions appeared to separate thought processes and wave responses into left and right hemispheres. At this point there appeared to be a separation of thought processes into left hemisphere (cognitive thought processes) and right hemisphere (affective thought processes). This was said to be a confusing time for the young male as early schooling is primarily cognitively oriented. As the right side of the brain developed, research showed that there was sometimes a communication loss between the hemispheres, resulting in perceptual confusion. Female thought processes were said to operate from both hemispheres, operating as a single entity, until 11-14 years of age. Sometime at this point, these

thought processes were said to separate into the affective and cognitive. Sylwester said that the female was more emotionally adjusted and was better able to cope with this adjustment in brain functions. These factors, although reported from research which is still in the early stages and therefore unproven, may have an influence on the learning process and a student's perception of affective content whether it is in black and white or color. Gardner (1975) offered support to Sylwester's theory. He stated that it was common for children to suffer from dyslexia during early childhood (5 to ten years of age) as the hemispherical development of the brain comes to completion. Both Pines (1973) and Blundell (1975) have reported in great detail the development of the left and right hemispheres of the brain. Research in this area has shown that affective responses are processed in the right hemisphere. These include memory of faces, perception of geometric forms, artistic talent, non-verbal reasoning and the perception and retention of music.

Research in the affective area has therefore suggested:

1. Students liked color better.
2. Color may be a precursor of better recall.
3. Color has psychological impact on the learner which may be related to prior experiences.
4. Students at different ages react differently to color, with older students scoring better.
5. Students with different psychological makeup react differently to color.

6. Color holds attention.

7. Varied reaction to color and affective content may be due to the maturation process.

8. Color elicits emotional responses which may affect cognition.

The findings of both cognitive and affective research leave unanswered questions regarding the student's response to color. Obviously, the possibility that maturation is related to interpretation of colored content must be explored along with the question of whether color increases affective learning.

The Maturation Process

A brief overview of the maturation process is essential in understanding the mental development of the child. Research by Piaget (Phillips, 1969) and Erikson (1950), should help to clarify the various developmental levels. Piaget has divided the development of the child into four main stages:

1. The sensory-motor period - ages 0 to 2 years.

2. The pre-operational stage - ages 2 to 7 years.

3. Concrete operations - ages 7 to eleven years.

4. The formal operations stage - eleven and upward.

Piaget would emphasize that these stages are flexible; the age of the child in any stage may vary in either direction by up to two years. A major problem of the Piagetian model is its narrow focus at the formal operations stage. His model omits developmental stages from age 15 to adulthood.

Erikson's (1950) levels of development are also presented to clarify these periods. His interpretation of maturation, with eight divisions, is somewhat more complex than Piaget's. The divisions are as follows:

Developmental Stage	Basic Component
1. Infancy	Trust vs. mistrust
2. Early childhood	Autonomy vs. shame, doubt
3. Preschool age	Initiative vs. guilt
4. School age	Industry vs. inferiority
5. Adolescence	Identity vs. identity confusion
6. Young adulthood	Intimacy vs. isolation
7. Adulthood	Generativity vs. stagnation
8. Senescence	Ego integrity vs. despair

These levels of maturation, as outlined in both models, result in different reactions by the child to mediated content at each of the developmental stages. The formal operations stage is characterized by development of the capacity to think abstractly, and to generate hypotheses and test them against the evidence. Erikson's adolescence and young adult stage also place the child's thought processes at this level. The child would probably manifest a cautious approach to the evaluation of mediated materials.

The students in this study were in both the adolescence and young adulthood levels. These categories help to define the formal operations stage. The grade seven population was in a transitional stage between concrete and formal operations, or at the beginning of the

adolescence stage, whereas the grade 12 subjects were clearly into the young adulthood level. Maturation effects on test scores would therefore reflect a cautious nature at the grade 12 level and a period of vacillation with the grade seven subjects varying from scores similar to both the grade four and grade 12 levels. The grade four population was clearly in the concrete operations or school age stage. For most children this is a stage of industry and initiative. They are industrious and responsive. This responsiveness would reflect in test scores if any differences in maturation were to show in the study. Conger (1973) noted maturation differences in sex at the adolescence level. He noted from ages ten and upward, response scores of girls on verbal ability were generally higher than boys, while males were better at mathematical skills. These thought processes are at the cognitive level and therefore may not show up at the affective level. A sex variable was also included in the study to test for sex differences at the three levels in relationship to maturation level. Sylwester's research also noted sex differences at the concrete operations stage which was added support for including this variable.

Chapter 3

DESIGN AND PROCEDURE OF THE STUDY

Subjects

One hundred and forty-eight subjects of different maturation levels were selected from three levels of schooling in the Calgary Public School System. The sample consisted of 52 grade 12 students of average age 17; 44 grade seven students of average age 13; and 52 grade four students of average age ten. Each group consisted of two classes who were shown either black and white or color slides. All classes selected were chosen for average ability. Streaming by the school system had been carried out by previous testing procedures. It was felt that the sample selected in this study reflected the population at large, namely all children in the Calgary public schools. Although the sample was smaller than desired, because of limitations in class size and the schools available for testing, the number of responses per student (140) were judged to be sufficient to compensate for small sample size. Other factors contributing to sampling procedures were: the entire grade four population in both schools was tested, and high school students were selected from average ability classes whose enrollments were randomly assigned by computer when the school timetable was prepared.

Materials

Due to weaknesses in the study by Winn and Everett (1978), more stringent procedures were taken during the selection of test materials. Five hundred and seventy-two pictures of strong affective content were selected from publications in both the photography and art fields. Criteria for selection were based upon the following factors. Content had to be of:

1. high positive or negative emotional appeal
2. a highly active or passive nature
3. a full range of color, with no single color being predominant
4. a cross-section of content from realism to abstraction.

These pictures were then viewed again by the author and his eight-year-old daughter, neither of whom have any color vision deficiencies. Each person separately sorted the pictures, according to the above criteria. The pictures selected by each were then compared, and only those pictures which had similar appeal to both subjects were selected. This process resulted in 52 highly affective pictures being chosen. These pictures were then reproduced on color slide film. Precautions were taken during duplication to ensure as close a reproduction of original color as possible. Lighting conditions were daylight (5600 degrees Kelvin) between the hours of 11:00 a.m. and 1:00 p.m.

The next phase in slide selection was an evaluation session by 56 grade eleven Visual Communication students who had been taught elements of visual awareness and affective content. These students

were given a set of semantic differential scales from Osgood, Tannenbaum and Suchi (1957) to evaluate each slide. Each scale was as follows:

ACTIVE	1 2 3 4 5 6 7	PASSIVE	(Activity)
GOOD	1 2 3 4 5 6 7	BAD	(Evaluation)
HEAVY	1 2 3 4 5 6 7	LIGHT	(Potency)

Subjects were shown each slide for ten seconds in which time they were required to make an evaluation on each dimension. (Ten seconds response time was chosen as 30 seconds was used in the Winn and Everett (1978) study where three sets of three scales in each dimension were used to evaluate each slide.)

The means of scores on each affective dimension were then calculated and the three slides with the highest and lowest means on each set of scales were chosen. Three slides appeared in more than one dimension, therefore reducing the number of slides selected to 14 from 18 (See Table 1, page 28). Black and white duplicates of these slides were then made.

Next, a set of plates from the Ishihara (1976) color blind test were obtained and reproduced in slide form so that all subjects could be simultaneously pre-tested for color blindness. The slides were pre-tested by students with known color deficiencies to check their validity.

Table 1. Means of Pre-tested Affective Content Slides

	Affective Dimension		
Slide	Evaluation	Potency	Activity
1. Oil	4.304	4.250	3.375
2. Farm	3.618	4.218	4.491
3. Hands	4.455	4.518	5.071
4. Deer	2.893	3.929	3.107
5. Cheetah*	2.179	2.125+	1.857
6. Cheetahs	2.268	2.750	2.250
7. Dog	3.304	3.893	3.571
8. Apartment*	4.964	5.500	5.589+
9. Street	3.196	3.679	2.518
10. Parachutists*	1.446+	2.357	1.304
11. Horse*	2.321	2.839	1.214+
12. Fire	4.509	3.618	2.964
13. Children	5.000	5.388	5.463
14. Ghost Girl*	5.071+	5.804+	5.321
15. Girl Laughing	4.473	4.418	3.600
16. Old Man	2.818	3.855	4.236
17. Old Woman	4.000	4.464	4.429
18. Girl	2.727	2.946	3.364
19. Grannies	4.679	4.643	5.125
20. Gevenchies	3.036	3.536	2.821

Table 1 (continued)

	Affective Dimension		
Slide	Evaluation	Potency	Activity
21. Red Horse	3.946	4.393	4.464
22. Raggedy Ann	3.306	3.464	3.321
23. Pool Boys	4.089	4.107	3.268
24. Fat Man	4.054	4.214	3.607
25. War	4.127	4.764	2.291
26. Cricket	3.268	3.750	2.804
27. Bug	3.333	3.426	2.500
28. Flowers	3.625	4.036	4.750
29. Garden	3.536	4.196	4.464
30. Iris	3.911	4.196	3.536
31. Rose	3.091	3.691	4.436
32. Abstract Blob*	4.875+	5.964+	5.125+
33. Zebra (abstract)	2.893	3.036	3.232
34. Fork*	2.518+	3.268	2.768
35. Frozen Leaf	3.804	4.554	3.696
36. Painting*	5.179+	5.304+	4.464
37. Abstract	4.375	4.339	3.946
38. Umbrella	3.500	3.768	3.679
39. Water*	2.636	4.200	2.309+
40. Paint*	4.875	5.125	5.000+

Table 1 (continued)

Slide	Affective Dimension		
	Evaluation	Potency	Activity
41. Flowers	4.679	4.589	4.429
42. Oil Slick*	2.446+	3.107	2.679
43. Crystal	3.929	3.982	3.304
44. Green Leaf	4.464	4.268	3.946
45. Red Leaf	3.750	3.857	4.054
46. Whirling Lights	3.161	3.268	2.786
47. Red/Green Blob	4.127	3.873	3.491
48. Rose Petal	3.418	4.089	3.164
49. Colored Lines	3.714	4.089	3.625
50. Lights, Circle*	2.518	3.714	2.339+
51. Stained Glass*	2.571	2.576+	2.393
52. Ferris Wheel*	2.527	2.582+	2.400

*Slides selected for the study

+Dimension slide selected for

Procedure

Subjects in each grade level were assigned to one of the two treatment groups, black and white or color. Each subject was given an instrument which consisted of ten randomly ordered semantic differential scales, and a score sheet to respond to the color blind test, as well as to record sex and grade (See Appendix A). The scales are found in Table 2.

Table 2. Affective Scales in Each Dimension and Their Factor Loadings

Dimension/Scales	Factor Loadings*
Evaluation	
Good - Bad	r=.88
Happy - Sad	r=.76
Fair - Unfair	r=.83
Potency	
Large - Small	r=.62
Strong - Weak	r=.62
Heavy - Light	r=.62
Activity	
Fast - Slow	r=.70
Hot - Cold	r=.46
Restless - Quiet	r=.79
Color	
Red - Blue +	

* "r" represents the factor loadings of each pair of adjectives on the dimension in which it appears. It therefore shows the degree of correlation between the scale and the dimension.

+ This scale does not have an "r" value as it was not originally rated by Osgood et al (1957) but a red-green adjective pair loads on all factors.

A separate sheet was included for each slide. The instrument was explained to each class in identical terms. All scales were explained by the experimenter so that the meaning of each term was clear. Students were allowed to ask questions if they were unsure of the meaning of a term. The relevance of each square on the scale was explained by relating to its degree of strength, weakness or neutrality of feeling. Each student was then given a booklet.

The first procedure consisted of showing each slide in the color blind test for three seconds to each treatment group. Size of the image on the screen was restricted to 36 inches to account for average viewing distance of 12 feet. This reproduced, in a scaled-up version, the actual conditions set out by Ishihara (1976) in the case of individual administration. Both black and white and color groups were shown this test in order to keep the test conditions identical. Subjects then rated the 14 color or black and white slides on the semantic differential scales. (No serious color deficiencies were found in any of the treatment groups, providing evidence that failure to test color blindness would result in negligible error in large group samples.)

Due to a problem of time reaction perceived with grade seven subjects in the Winn and Everett (1978) study, the viewing time was set at 45 seconds per slide. This adjustment appeared to eliminate the problem of missed scores which occurred in the previous study.

Assumptions

The following assumptions were made in the study:

1. The sample was sufficiently large that conclusions drawn from the data using an F-test will be valid.

2. The effects of various factors on the total variance are additive.

Analysis of Data

Scores on the evaluation, potency, activity and color dimensions were calculated for each slide. The data were analyzed using analysis of variance. A three-way analysis of variance, treatment by sex by grade, was performed. One-way analysis of variance was conducted, with a Newman-Keuls multiple range test to test differences among means of the three age groups. SPSS sub-programs ANOVA, ONEWAY and BREAKDOWN (Nie, Hull, Jenkins, Steinbrenner, and Bent, 1970) were performed on the color and black and white ratings (grades four, seven and 12) of each slide. The independent variables were sex (S), group (G), and treatment (TREAT, color or black and white). Dependent variables were student scores in the evaluation, potency, activity and color dimensions. Alpha was set at .05 for all tests of significance, though certain trends significant at the .1 level were also examined.

Chapter 4

RESULTS OF THE STATISTICAL ANALYSIS

There are certain elements which must occur in the statistical results to reflect support for the hypotheses of this study. They are as follows:

Hypothesis One: There will be significant differences among test scores of students in the group, sex, and treatment dimensions at the grade four, grade seven and grade 12 levels, who have viewed the same highly loaded affective content slides in either the black and white or the color medium. Statistical support for this hypothesis is found in:

1. group by treatment interactions
2. a significant difference in mean scores of the groups
3. sex by treatment interactions which may also occur (must also show differences across groups)
4. group differences in the majority of slides. (As well, the scores of grade 12 subjects must reflect reservation as mentioned earlier (Erikson, 1950). Significant differences should appear between grade four subjects and grade 12 subjects with the grade four subjects reacting in a more spontaneous manner. A significant difference in male-female scores will also reinforce a maturation trend.)

Hypothesis Two: A comparative analysis of students' affective response scores to black and white and color media will show significant differences due to treatment between the color and black and white medium.

Statistical support for this hypothesis is found in:

1. significant differences in the treatment category

2. significant differences on abstract slides due to treatment.

Overall Results

The overall results in this study revealed significant findings in three of the four dimensions. Only total activity scores did not reveal significant differences at the .05 level.

Areas of significance in the total evaluation dimension were, sex $F(1, 146)=9.258$, $p< .01$ and group, $F(2, 146)=19.592$, $p< .001$, with a two-way sex by treatment interaction, $F(2, 146)=4.350$, $p< .05$. A look at the mean scores revealed that the color slides were evaluated "better, more happy and fairer" than black and white. Males from all grade levels rated slides lower and further from the mean than females showing a more cautious reaction by the female groups. A Newman-Keuls comparison across grade levels revealed a significant difference at the .05 level among the scores of subjects from grade 12, seven and four, with the grade four subjects rating the slides significantly better than the grade seven and grade 12 subjects and the grade seven subjects rating the slides significantly better than the grade 12 subjects. Grade 12 means were close to the scale mean showing a more cautious approach to evaluation than the other groups. The sex by treatment interaction showed the males rating the color slides lower than the females with no difference in black and white, thereby confirming the hypothesis that females mature at a different rate from males (See

Table 3).

Table 3. Analysis of Variance, Two-way Interaction Between Sex and Treatment of the Total Evaluation Scores

	Sex		
Treatment	Male	Female	
Black and White	3.7220	3.777	3.7495
Color	3.4292	3.8545	3.6419
	3.5756	3.8156	

A sex by group interaction, $F(2,146)=2.574$, $p< .1$ ($p=.080$), showed the males rating the slides lower across all groups with the greatest difference occurring at the grade four level (See Table 4).

Table 4. Analysis of Variance, Two-way Interaction Between Sex and Group of the Total Evaluation Scores

	Group			
Sex	Grade 12	Grade 7	Grade 4	
Male	3.9875	3.6089	3.1396	3.5757
Female	4.1063	3.7033	3.6382	3.8159
	4.0424	3.6561	3.3889	

It is therefore evident at the evaluation dimension that maturation is indeed a factor in the evaluation of affective content in black and white and color.

Significant differences appeared in the potency dimension for sex, $F(1, 146)=8.174$, $p< .01$ and treatment, $F(1, 146)=4.215$, $p< .05$ (See Table 5).

Table 5. Analysis of Variance, Mean Ratings of Groups by Sex and Treatment of the Total Potency Scores

	Group						
Treatment	Grade 12		Grade 7		Grade 4		
Sex	Male	Female	Male	Female	Male	Female	
Black and White	3.5913	3.8509	3.6081	3.7857	3.5986	3.7765	3.7019
Color	3.6412	3.8040	3.8299	4.3333	3.7123	4.0778	3.8998
	3.6163	3.8275	3.7190	4.0595	3.6555	3.9272	

Males at all grade levels rated slides more potent than females. Black and white slides were significantly more potent than slides in color. This appraisal indicated that the black and white pictures appeared stronger, larger and more heavy. The reaction of the male subjects in the study added more reinforcement for the acceptance of hypothesis number one. The difference in potency for treatment also supported the contentions of hypothesis number two.

Significant differences also occurred on the color dimension. Treatment, $F(1, 146)=4.831$, $p< .05$, was again a factor of significance as was group, $F(2, 146)=3.523$, $p< .05$ (See Table 6).

Table 6. Analysis of Variance, Mean Ratings of Group, Sex and Treatment of the Total Color Scores

	Group						
Treatment	Grade 12		Grade 7		Grade 4		
Sex	Male	Female	Male	Female	Male	Female	
Black and White	4.2857	4.4962	4.3242	3.9351	4.3571	4.2540	4.2754
Color	4.2143	4.3626	3.8469	4.0385	3.5952	4.1429	4.0334
	4.2500	4.4294	4.0856	3.9868	3.9762	4.1985	

Black and white slides were rated significantly more blue than color slides and the grade 12 subjects rated the slides significantly more blue than the other groups (See Table 7, page 39). It was apparent that treatment in three of four dimensions was an important influence on affective reactions. Although there were no areas of significance at the .05 level in the activity dimension, Osgood et al (1952) stated that the color dimension has high correlations with both activity and evaluation as well as a lower correlation with the potency dimension. It is therefore said to be an independent factor and could add support to the hypothesis that color affected affective responses over all

dimensions. Added support also appeared in trends on the activity dimension. Treatment in the activity dimension showed a trend, $F(1, 146)=2.804$, $p< .1$ ($p=.096$) as well as a sex effect, $F(1, 146)=3.382$, $p< .1$ ($p=.068$). Black and white slides were rated more active than color slides and males rated the slides more active than females.

Table 7. Analysis of Variance, Mean Ratings of Group and Treatment of the Total Color Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	4.3909	4.1297	4.3163	4.2754
Color	4.2885	3.9427	3.8691	4.0334
	4.3397	4.0363	4.0927	

A trend in group by treatment interactions appeared in the activity dimension, $F(2, 146)=2.406$, $p< .1$ ($p=.094$). Treatment had a greater effect on the grade 12 subjects than it did on the grade seven and grade four subjects. Black and white slides were rated more active (See Table 8, page 40). On the color dimension a trend appeared in sex by treatment interactions, $F(1, 146)=3.073$, $p< .1$ ($p=.082$). Treatment had a greater affect on the males, with the black and white slides being rated blue and color slides red. Females rated both black and white and

color slides blue (See Table 9).

Table 8. Analysis of Variance, Mean Ratings of Groups and Treatment of the Total Activity Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	3.8000	3.7768	3.8633	3.8100
Color	3.9970	3.8353	3.9000	3.9110
	3.8985	3.8011	3.8817	

Table 9. Analysis of Variance, Mean Ratings of Sex and Treatment of the Total Color Scores

	Sex		
Treatment	Male	Female	
Black and White	4.3228	4.2284	4.2756
Color	3.8859	4.1813	4.0334
	4.1042	4.2049	

Abstract versus Concrete Slides

A second overall view was obtained by looking at the total scores of abstract slides in each dimension as opposed to the concrete slides in the study. Abstract slides showed signficant differences in

the total evaluation and color dimensions. Group, $F(2, 146)=17.431$, $p < .001$, and treatment, $F(1, 146)=14.606$, $p < .001$, were again areas of significance (See Table 10).

Table 10. Analysis of Variance, Mean Ratings of Sex, Group and Treatment of the Total Abstract Evaluation Scores

Treatment	Grade 12		Grade 7		Grade 4		
Sex	Male	Female	Male	Female	Male	Female	
Black and White	4.2698	4.1754	3.9890	3.6277	3.7415	3.7407	3.9240
Color	3.8401	4.1502	3.4150	3.5531	2.7143	3.4476	3.5201
	4.0550	4.1628	3.7020	3.5904	3.2279	3.5942	

Mean scores revealed that abstract color slides were rated better than black and white. Grade 12 subjects, as in evaluation of both types of slides together, repeated their cautious evaluation by rating the slides closer to the scale mean with the grade seven and grade four subjects rating the slides better. The means also revealed that the grade four students were less cautious than the grade seven and grade 12 subjects, rating the abstract slides better than the other groups. A two-way sex by treatment interaction on evaluation, $F(1, 146)=7.174$, $p < .01$, revealed that treatment had a greater effect on male scores than it did on female scores with the males rating the abstract color slides

"better" than black and white slides and "better" than the females' color evaluation score (See Table 11).

Table 11. Analysis of Variance, Mean Ratings of Sex and Treatment of the Total Abstract Evaluation Scores

	Sex		
Treatment	Male	Female	
Black and White	4.0000	3.8479	3.9240
Color	3.3231	3.7170	3.5201
	3.6616	3.7825	

The findings in abstract evaluation continued in total abstract color means. Abstract color slides were rated redder than black and white, which were rated blue, with a significant difference appearing due to treatment, $F(1,146)=8.703$, $p< .01$ (See Table 12, page 43).

Trends were noted in the potency dimension for sex, $F(1,146)=3.557$, $p< .1$ ($p=.061$) and treatment, $F(1,146)=3.461$, $p< .1$ ($p=.065$), and in the color dimension for group, $F(2,146)=2.542$, $p< .1$ ($p=.082$). These trends signified that the males rated the abstract slides more potent than females and that black and white abstract slides were more potent than color slides (See Table 13, page 43). The grade seven subjects rated the slides slightly red while the grade four and grade 12 subjects rated the slides slightly blue (See Table 12, page 43).

Table 12. Analysis of Variance, Mean Ratings of Sex, Group and Treatment of the Total Abstract Color Scores

	Group						
Treatment	Grade 12		Grade 7		Grade 4		
Sex	Male	Female	Male	Female	Male	Female	
Black and White	4.4286	4.3759	4.3407	4.0519	4.3673	4.2698	4.3057
Color	4.1531	4.2857	3.9184	3.5824	3.5119	4.0095	3.9102
	4.2909	4.3308	4.1296	3.8172	3.9396	4.1397	
	(4.3119)		(3.9734)		(4.0397)		

Table 13. Analysis of Variance, Mean Ratings for Sex and Treatment of the Abstract Potency Scores

	Sex		
Treatment	Male	Female	
Black and White	3.6999	3.7768	3.7384
Color	3.7907	4.0251	3.9079
	3.7453	3.9010	

The results of the analysis of the abstract dimension also add additional support to the preliminary study by Winn and Everett (1978) that color slides usually were rated redder and black and white slides were rated

more blue.

A look at the total scores on concrete slides added information on the different student reactions to the two types of slides. On the concrete evaluation dimension, significant differences were due to sex, $F(2,146)=12.551$, $p< .001$, and group, $F(2,146)=10.842$, $p< .001$. A trend was noted for treatment, $F(1,146)=3,820$, $p< .1$ ($p=.053$) (See Table 14).

Table 14. Analysis of Variance, Mean Ratings of Sex, Group and Treatment of the Total Concrete Evaluation Scores

	Group						
Treatment	Grade 12		Grade 7		Grade 4		
Sex	Male	Female	Male	Female	Male	Female	
Black and White	3.8175	4.1103	3.3919	3.6104	3.1224	3.3995	3.5753
Color	3.9864	3.9890	3.6395	4.0220	2.9802	3.9651	3.7637
	3.9019	4.0497	3.5157	3.8162	3.0513	3.6823	

Males at all levels again rated the slides "better" than the females, but a difference of direction from abstract slides appeared in treatment. In this case, as opposed to abstract evaluation, concrete black and white slides were rated better than color slides. This gives support to hypothesis number two. Color did indeed affect the affective responses. Black and white slides were rated better perhaps because the "noise"

factor, noted by Katzman and Nyenhuis (1972), had been removed thereby allowing students to concentrate on the affective concrete content rather than color. In the abstract slides, the important affective content was primarily the color with the shape being secondary. The affective color content was therefore pure and was not affected by the affective meaning of any identifiable objects in the picture. The subjects therefore rated the abstract color slides "better" than the black and white. The potency dimension of the concrete slides revealed a significant difference by sex which also appeared as a trend with the abstract slides. Males at all grade levels rated the slides in both black and white and color as arousing more potent feelings (See Table 15)

Table 15. Analysis of Variance, Mean Ratings of Sex, Group and Treatment of the Total Concrete Potency Scores

	Group						
Treatment	Grade 12		Grade 7		Grade 4		
Sex	Male	Female	Male	Female	Male	Female	
Black and White	3.4841	3.9248	3.6886	3.7619	3.3265	3.7672	3.6589
Color	3.5748	3.9487	3.8503	4.4286	3.6111	3.9775	3.8986
	3.5295	3.9368	3.7694	4.0953	3.4688	3.8725	

This is further support for hypothesis number one as it has been established that females mature earlier than males.

Trends continued to appear on the activity dimension for sex, $F(1,146)=3.163$, $p< .1$ ($p=.078$). Male subjects again rated the slides more active than female subjects. A group trend also appeared on the Newman-Keuls one-way analysis, $F(2,146)=2.382$, $p< .1$ ($p=.096$), with the grade seven subjects rating the slides more active than the grade four subjects and the grade four subjects rating the slides more active than the grade 12 subjects (See Table 16).

Table 16. Analysis of Variance, Mean Ratings of Sex, Group and Treatment of the Total Activity Concrete Scores

	Group						
Treatment	Grade 12		Grade 7		Grade 4		
Sex	Male	Female	Male	Female	Male	Female	
Black and White	3.8890	4.1103	3.6190	3.6840	3.8571	3.7196	3.8132
Color	3.8537	3.9487	3.8980	3.9231	3.6587	4.0413	3.8873
	3.8714	4.0295	3.7585	3.8036	3.7579	3.8805	
	(3.9500)		(3.7811)		(3.8192)		

Sex, $F(1,146)=2.945$, $p< .1$ ($p=.088$), and sex by treatment trends were observed on the color dimension, $F(1,146)=3.529$, $p< .1$ ($p=.062$). Males rated the concrete slides slightly bluer than the female

subjects. Treatment had a greater effect on the male scores than it did on the female scores. Males rated black and white slides bluer than females and color slides redder than females who rated color slides bluer than black and white slides (See Table 17).

Table 17. Analysis of Variance, Mean Ratings of Sex and Treatment of the Total Concrete Color Scores

	Group		
Treatment	Male	Female	
Black and White	4.2658	4.2243	4.2451
Color	3.9100	4.4034	4.1567
	4.0879	4.3139	

It is apparent from the comparison of total scores of subjects of grades 12, seven and four, that the notion that maturity is associated with caution is supported by the study. Hypothesis number one was therefore repeatedly supported by the study. Grade four students were more extreme in their responses than those from grade 12 and grade seven and the male sample was more extreme in its response and therefore showed a slower rate of maturation than females.

Individual Slide Results

Slide One. The first slide evaluated on the instrument was an abstract painting, with a full range of color, and composed of irregular

shapes and patterns of color. This slide was chosen from the pre-selected slides for its high mean in both the evaluation and potency dimensions (5.179, 5.304). The results from slide one on evaluation revealed significant differences due to treatment, $F(1, 146)=11.288$, $p< .001$, with a two-way interaction between group and treatment, $F(2, 146)=6.130$, $p< .01$ (See Table 18).

Table 18. Analysis of Variance, Means for Group and Treatment of Slide One for Evaluation Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	4.5278	5.1800	4.4822	4.7299
Color	3.3813	4.6166	4.5371	4.5117
	4.4545	4.8989	4.5097	

Black and white slides were rated "worse" than color. The group by treatment interaction revealed that the grade seven subjects rated the black and white slides "worse" than color slides, while the grade 12 and grade four students did not. The potency dimension revealed differences due to group, $F(2, 146)=4.267$, $p< .05$, and treatment, $F(1, 146)=4.041$, $p< .05$ with a two-way interaction between sex and treatment, $F(1, 146)=4.788$, $p< .05$. A Newman-Keuls multiple range test revealed that the grade 12 subjects' mean scores were significantly lower than

both grade seven and grade four subjects ($p < .01$). This indicated, on this particular slide, that the grade 12 students rated it "heavier, hotter and stronger" than the other groups. The sex by treatment interaction revealed that the males rated black and white slides more potent than color slides, while the reverse was found for females (See Table 19).

Table 19. Analysis of Variance, Means for Sex and Treatment of Slide One for Potency Scores

	Sex		
Treatment	Male	Female	
Black and White	3.4995	3.3082	3.4019
Color	3.3390	4.1174	3.7282
	3.4173	3.7128	

The treatment had a greater affect on the females. The color treatment displayed scores reflecting a feeling of "weakness", while the black and white treatment resulted in a more potent evaluation.

In the activity dimension, a significant difference was found due to treatment, $F(1, 146)=3.871$, $p < .1$ ($p=.051$). The color slides were rated less active.

An overall look at the rating of slide one suggested that the black and white treatment was rated "worse", more potent and more

active than the color treatment. Grade seven subjects rated the black and white slide "worse" than the other groups. Males rated the black and white slide "worse" than females, who rated color "worse". On this slide, therefore, color tends to lessen the negative impact of affective responses and this impact had a greater affect at the grade seven level. Some support for hypothesis two was therefore evident. The fact that males rated the black and white slide "worse" than females and the females rated the color slide "worse", adds some support to hypothesis one. The color treatment resulted in the females scoring at a more sophisticated level of interpretation of affective content.

Slide Two. A group of parachutists in the air was the content of this picture. Slide two revealed significant differences on the same dimensions as slide one. The slide was initially selected for low mean ratings in evaluation (1.304). Differences on evaluation were due to sex, $F(1,146)=4.960$, $p< .05$, and treatment, $F(1,146)=3.514$, $p< .1$ ($p=.063$). On the potency dimension, significant differences were noted due to sex, $F(1,146)=7.545$, $p< .01$, and age group, $F(2,146)=5.162$, $p< .01$. Sex again resulted in a significant difference in the activity dimension, $F(1,146)=8.624$, $p< .01$. A significant two-way interaction between sex and group was also present in evaluation, $F(2,146)=3.830$, $p< .05$. Sex made a greater difference in positive evaluation ratings of grade four subjects than it did at the grade seven and grade 12 levels, with the males reacting significantly more positive than females (See Table 20, page 51).

Table 20. Analysis of Variance, Means for Sex and Group of Slide Two for Evaluation Scores

	Group			
Sex	Grade 12	Grade 7	Grade 4	
Male	2.2302	1.7564	1.5873	1.8580
Female	2.1120	2.0839	2.8019	2.3326
	2.1711	1.9202	2.1946	

One-way analysis of variance on potency scores using the Newman-Keuls multiple range test, revealed that grade seven mean scores varied significantly from both grade four and grade 12 subjects. The grade seven subjects rated the slide more potent than the other groups. Sex differences accounted for the males rating the slide "better", and more active while the females rated the slide higher on potency or "worse" than males. Color slides were rated "better" than black and white. Grade seven subjects rated the slide "lighter", "smaller", and "weaker" than the grade four and grade 12 subjects.

Slide two therefore revealed that color and sex were major factors in the slide being rated "better" with males reacting more extremely in their evaluation. Support for hypothesis one was noted in sex by group interactions, $F(2, 146)=2.872$, $p < .1$ ($p=.092$). Male scores at the grade seven level accounted for these students scoring on a lower mean. The theme of the picture may have caused fear in the

female subjects and the grade four group, and caution at the grade 12 level. This was noted by potency scores. Color appeared to add a positive influence on evaluation which suggested support for hypothesis number two.

A trend which appeared on the color dimension on slide two was a two-way interaction between sex and treatment, $F(1, 146)=2.872$, $p< .1$ ($p=.092$). Males rated the colored slide more red and the black and white slide more blue than the females. This also agrees with the earlier Winn and Everett (1978) study that color slides rated red are also rated "better" (See Table 21).

Table 21. Analysis of Variance, Means for Sex and Treatment of Slide Two for Color Scores

	Sex		
Treatment	Male	Female	
Black and White	4.0464	3.3056	3.6760
Color	2.9087	3.4633	3.1860
	3.4776	3.3845	

Slide Three. Slide three was an abstract mosaic of lights and circular patterns with a blending of colors from all sections of the spectrum. It was chosen because of its positive activity rating (2.4). Significant differences were found in evaluation, activity and color.

The group effect, $F(2, 146)=14.023$, $p< .001$, on the evaluation dimension, was significant, with the grade four subjects rating the slide "better" than the grade seven subjects and the grade seven subjects rating the slide "better" than the grade 12 group. A group difference was noted in the activity dimension, $F(2, 146)=6.21$, $p< .01$, with the grade 12 subjects rating the slide more active than the grade seven and grade four groups. The color dimension was another area of significance due to treatment, $F(1, 146)=6.493$, $p< .05$, with color slides being rated redder than the black and white slides.

Support for hypothesis one was found on this slide by the apparently less reasoned, more impulsive responses on the evaluation dimension of the grade four subjects. A maturation difference was found in the more active rating by grade 12 subjects. This could reflect more sophistication by the grade 12 group in evaluating an abstract slide. Hypothesis two was supported as the color slide was again rated redder than the black and white slide.

Slide Four. The fourth slide in the series was compositionally identifiable, but abstract in arrangement. It was a knife, fork and spoon on series of colored blocks adjacent to mirrors on each side. It was therefore classified as a concrete slide. Both reds and blues were dominant in this slide.

Group, $F(2, 146)=19.705$, $p< .001$, and treatment, $F(1, 146)=6.100$, $p< .05$, both showed significant differences on evaluation. The grade 12 mean was larger than the grade seven and grade four means

whose ratings were "better" than those in the grade 12 group. This provided further support for the impulsiveness of the grade four subjects and reservation by older students. A sex by treatment interaction occurred on evaluation, $F(1, 146)=6.965$, $p< .01$. This signified that treatment had a greater affect on the ratings of female subjects than it did on male subjects. Females rated the black and white slides "better" than color, while the reverse was true for the male subjects (See Table 22).

Table 22. Analysis of Variance, Means for Sex and Treatment of Slide Four for Evaluation Scores

	Sex		
Treatment	Male	Female	
Black and White	3.0271	2.4796	2.7534
Color	2.8624	3.3624	3.1124
	2.9446	2.9210	

A group by treatment interaction on the same dimension, $F(2, 146)= 2.548$, $p< .1$ ($p=.082$), occurred, suggesting treatment had a greater effect on the grade seven scores than on the grade 12 and grade four scores. Black and white slides were rated "better" by the grade seven subjects whereas the grade four and grade 12 subjects rated the black and white and color slides similar within their groups (See Table 23).

Table 23. Analysis of Variance, Means for Group and Treatment of Slide Four for Evaluation Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	3.8348	2.2401	2.1852	2.7534
Color	3.6502	3.1644	2.5222	3.1123
	3.7425	2.7023	2.3537	

The black and white slide was rated better than the color slide, possibly as a result of the realism of the silverware in the black and white medium.

A group difference appeared in the activity dimension, $F(2,146)=5.156$, $p< .01$, with the grade 12 subjects rating the slide less active than the grade seven and grade four subjects. The grade four subjects were again more impulsive, with the most active scores.

Group differences were significant in the color dimension, $F(2,146)=7.383$, $p< .001$. Grade seven students rated the slide red with the fourth and twelfth grades rating the slide blue. A sex by treatment interaction, $F(1,146)=3.297$, $p< .1$ ($p=.072$), suggested that treatment resulted in a greater difference on the female scores than it did on the male scores. Males rated the black and white slide blue and the color slide red, whereas the female subjects rated in a reverse manner (See Table 24, page 56).

Table 24. Analysis of Variance, Means for Sex and Treatment of Slide Four for Color Scores

	Sex		
Treatment	Male	Female	
Black and White	4.3706	3.7697	4.0729
Color	3.8651	4.3915	4.1283
	4.1179	4.0806	

Support is therefore provided for hypothesis one. Not only were the grade four subjects more impulsive in evaluation, but also in activity. Hypothesis two received some support as color was a factor in rating of scores by grade 12 subjects who reacted in a more reserved manner. A sex by treatment interaction, showing that color made a greater difference on female scores, also hinted at maturity as color resulted in more active ratings by male subjects. A group by treatment interaction on evaluation showed that treatment made a greater difference on grade seven scores and also emphasized a maturation trend since their mean scores vacillated between the scores of both the grade 12 and grade four subjects.

Slide Five. This picture, of warm coloration, was a Cheetah peering through tall grass. Only one area of significant difference appeared. Potency was the area of this difference which was due to sex, $F(1, 146)=5.356$, $p< .05$, with the males rating the slide more

potent than females.

Trends appeared on the evaluation dimension. First, a sex by group interaction appeared, $F(2, 146)=2.570$, $p< .1$ ($p=.080$), signifying that female and male scores were further apart in ratings of the grade four subjects than they were for the scores of the grade seven and grade 12 pupils. The grade four subjects reacted in a less "good", less "happy" manner which may have been a result of a fear factor related to the animal, particularly by the female subjects. This fear factor may stem from the age of the grade four students (See Table 25).

Table 25. Analysis of Variance, Means for Sex and Group of Slide Five for Evaluation Scores

	Group			
Sex	Grade 12	Grade 7	Grade 4	
Male	2.4008	2.8132	2.3354	2.5165
Female	2.5007	2.5408	3.1686	2.7367
	2.4508	2.6770	2.7520	

Secondly, a trend in group by treatment interaction occurred on evaluation, $F(2, 146)=2.611$, $p< .1$ ($p=.077$). Treatment made a greater difference on grade seven ratings than it did on grade 12 and grade four ratings. The color slide was rated less "good" than the black and white slide by the grade seven subjects. The grade 12 students

evaluated the slide in a reverse manner (See Table 26).

Table 26. Analysis of Variance, Means for Group and Treatment of Slide Five for Evaluation Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	2.5819	2.3998	2.5067	2.4961
Color	2.3196	1.9542	2.9973	2.7570
	2.4508	2.6770	2.7520	

A group trend appeared on the potency dimension, $F(2,146)=2.683$, $p< .1$ ($p=.072$), with the grade 12 subjects rating the slide more potent than the grade four and grade seven subjects.

Slide Six. A very unpopular slide in the series was a picture of paint peeling. It was abstract in nature with a balance of warm and cold colors. The only significant difference occurred in evaluation and was attributed to sex, $F(1,146)=7.719$, $p< .01$, with the females rating the slide "worse" than the males.

Trends were noted in evaluation and potency with group by treatment interactions. A treatment effect was also noted in potency, $F(1.146)=2.914$, $p< .1$ ($p=.090$). The black and white slide was more potent than the color slide. The group by treatment interaction on evaluation, $F(2,146)=2.693$, $p< .1$ ($p=.071$), revealed that the treatment

made a greater difference on the ratings of the grade four subjects than it did on the grade seven and grade 12 subjects. They rated the black and white slide "worse" than the color version (See Table 27).

Table 27. Analysis of Variance, Means for Group and Treatment of Slide Six for Evaluation Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	5.1842	4.7413	5.3876	5.1045
Color	5.3388	4.9378	4.6056	4.9607
	5.2615	4.8396	4.9966	

On the potency dimension, the trend manifested in the group by treatment interaction, $F(2,146)=2.667$, $p< .1$ ($p=.073$), revealed that treatment made a greater difference on ratings of grade seven students than it did on the grade four and grade 12 subjects. The grade seven pupils rated the black and white slide more potent than the colored slide with the grade 12 and grade four pupils rating the treatments about the same within their groups. The grade four subjects rated the slides least potent and the grade 12 subjects rated the slides most potent (See Table 28, page 60). Partial support for hypothesis one was found with females again being more cautious, and grade four subjects reacting more cautiously than the other groups. A trend toward support

for hypothesis two was found by the different effects of the black and white and color treatment on the subjects.

Table 28. Analysis of Variance, Means for Group and Treatment of Slide Six for Potency Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	3.8728	3.2087	4.3095	3.7970
Color	3.9496	4.2839	4.2611	4.1649
	3.9112	3.7463	4.2853	

Slide Seven.

An accident involving a steeplechase contestant and his horse was the subject matter of this concrete slide. A full range of color was present in the slide. Observed initial reactions noted hilarity by grade four subjects and grief and dismay by the grade 12 subjects. Reaction appeared mixed at the grade seven level. Significant differences were noted on all independent variables in the evaluation dimension. On sex, $F(1, 146)=7.526$, $p< .01$, on group, $F(2, 146)=3.336$, $p< .05$ and on treatment, $F(1, 146)=15.582$, $p< .001$. Female subjects evaluated the slide more "bad, sad and unfair", than the males. Grade 12 subjects rated the slide 'worse' than the grade seven and four subjects. The color slide was evaluated 'worse' than the black and white version.

Only treatment was significantly different on the potency dimension, $F(1, 146)=6.877$, $p< .01$, with the black and white slide being rated more potent than its color counterpart. A trend was revealed in potency by a sex by group interaction, $F(2, 146)=2.995$, $p< .1$ ($p=.053$), and by a group by treatment interaction, $F(2, 146)-2.389$, $p< .1$ ($p=.096$). Sex had a greater effect at the grade 12 level than at the grade seven and grade four levels. Females rated the slide less potent than the males (See Table 29).

Table 29. Analysis of Variance, Means for Sex and Treatment of Slide Seven for Potency Scores

	Group			
Sex	Grade 12	Grade 7	Grade 4	
Male	1.1499	1.4365	1.5577	1.3814
Female	1.3704	1.3135	1.6000	1.3870
	1.2602	1.3135	1.5789	

The group by treatment interaction indicated that treatment made a greater difference between scores at the grade seven level than it did at the grade 12 and grade four levels. The presence of color appeared to lessen the potency of the picture (See Table 30, page 62). The treatment variable was again significant in the activity dimension, $F(1, 146)=13.079$, $p< .001$, with the black and white slide being rated more

active than the color slide.

Table 30. Analysis of Variance, Means for Group and Treatment of Slide Seven for Potency Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	3.3246	3.0525	3.4630	3.2800
Color	3.5083	4.3773	4.0722	3.9860
	3.4165	3.7149	3.7676	

Sex and group variables accounted for significant differences on the color dimension. Grade four scores were significantly less than grade seven scores and grade seven scores were significantly less than grade 12 scores. This order follows a pattern with other interactions among the groups whereby the grade 12 scores are of a higher mean and therefore toward the blue end of evaluation. Female scores were significantly greater than those of males, also showing that females rated the slide more blue.

The reaction of the grade 12 group to this slide was to rate it "worse" than the other groups. This was apparent in their initial reaction. It was therefore logical that the grade four means would not be as extreme as the grade 12 means. This reaction to subject matter which can stimulate varying responses must surely result from the

maturation level of the child. The females' tendency to rate the slide "worse", as well as being responsible for the difference of scores among grade four subjects, grade 12 and grade seven subjects, also supported the maturation concept. Hypothesis two received partial support as color was a factor in lessening potency as well as the lack of color resulting in a more potent reaction to this slide.

Slide Eight. Evaluation, activity and color were the dimensions showing significant differences on slide eight, with a trend appearing on the potency dimension. This was an abstract photograph of a stained glass window. No recognizable object could have been perceived from the subject matter. Blues and reds were the predominant colors in the slide. The original selection of this slide was due to high potency (1.576).

Group, $F(2,146)=4.175$, $p<.05$, and treatment, $F(1,146)=6.878$, $p<.01$, were the significant factors in evaluation. A two-way interaction between sex and treatment appeared, $F(1,146)=5.125$, $p<.05$. A trend was also noted due to sex, $F(1,146)=2.846$, $p<.1$ ($p=.094$). Grade four subjects rated the slide "better" than the grade seven subjects with the grade 12 subjects rating the slide close to the scale mean. The color slide was rated "better" than the black and white slide. The trend in sex noted the males rating the slide "better". The two-way interaction between sex and treatment indicated that treatment made a greater difference to male scores than it did to the female

scores with males rating the black and white slide "worse" than the females and the color slide "better" than the females (See Table 31).

Table 31. Analysis of Variance, Means for Sex and Treatment of Slide Eight for Evaluation Scores

	Sex		
Treatment	Male	Female	
Black and White	4.2045	4.0574	4.1310
Color	2.7936	3.7578	3.2757
	3.4990	3.9076	

On the color dimension, a significant difference was noted due to treatment, $F(1, 146)=5.396$, $p< .05$, and a trend was revealed due to sex, $F(1, 146)=3.295$, $p< .1$ ($p=.072$). The color slide was rated red whereas the black and white slide was rated blue. Males rated the slide red and the females rated the slide blue, according to the Newman-Keuls multiple range test.

The maturation hypothesis appeared to gain more support as grade four subjects rated slides different from grade seven and grade twelve. Males were also reacting more impulsively than females, reinforcing the idea that females mature earlier than males.

Sex was a significant factor on the activity dimension, $F(1, 146)=3.987$, $p< .05$, with a trend appearing due to group, $F(2, 146)=2.718$,

$p < .1$ ($p = .070$). The males rated the slide more active than females, and the grade seven subjects rated the slide more active than the grade 12 subjects. A trend in the potency dimension on a two-way interaction of sex by treatment, $F(1, 146) = 2.611$, $p < .1$ ($p = .070$), was revealed. Color made a greater difference on female scores than upon the male scores.

The female subjects rated the black and white slide more potent and the color slide less potent whereas the males rated the slide in a reverse manner (See Table 32).

Table 32. Analysis of Variance, Means for Sex and Treatment of Slide Eight for Potency Scores

	Sex		
Treatment	Male	Female	
Black and White	3.9326	3.7109	3.8216
Color	3.6865	4.1025	3.8945
	3.8096	3.9067	

This could again signify that females act in a more reserved manner which is possible due to their higher level of maturation. Color appears to have had an adverse effect on the potency ratings of females by decreasing the potency of a colored slide.

Slide Nine. The ninth slide was chosen for its low mean score

on the activity dimension (2.304). It was a picture of rapidly moving water and was abstract in nature, but since its content was recognizable, it was rated as a concrete slide. It was predominantly blue and gold in color. The male subjects rated the slide more potent than females, $F(1, 146)=5.250$, $p<.05$, while the black and white version was rated more active than the color version, $F(1, 146)=8.903$, $p< .01$. No other significant differences appeared for this slide.

Slide Ten. High evaluation and potency means (5.071, 5.804) were the factors for selecting slide number ten. Its tonal gradation was primarily pinkish in nature. A ghostly looking girl was the subject of this slide. A significant difference was noted on evaluation on the group variable, $F(2, 146)=3.916$, $p< .05$. Grade four scores were significantly "better" than grade seven scores and grade seven scores were significantly "better" than grade 12 scores.

On the activity dimension, group was the area of significance, $F(2, 146)=5.774$, $p< .01$. Grade four subjects rated the slide active and the grade seven and grade 12 subjects rated it passive. A trend also appeared on treatment in this dimension, $F(1, 146)=2.911$, $p< .1$ ($p=.090$). The black and white slide was more passive than the color slide.

On the color dimension, group was an area where a trend was recorded, $F(2, 146)=2.808$, $p< .1$ ($p=.064$). Grade four subjects rated the slide significantly less blue than the grade 12 and grade seven subjects.

More support for hypothesis number one was found on this slide. Grade four subjects reacted differently from grade 12 and grade seven students. This was especially true on the evaluation dimension. For this slide, this factor again appeared significant for the activity dimension. A trend on the color dimension again reinforced a difference between these groups.

Slide Eleven. Slide 11 was a night picture of whirling, colored lights of a ferris wheel. No form was recognizable so the slide was classified as abstract. Group was the only area of significance on the evaluation dimension, $F(2, 146)=27.012$, $p< .001$. Grade four subjects rated the slide significantly "better" than the grade seven subjects who scored the slide significantly "better" than the grade 12 subjects. Two-way analysis of variance on evaluation revealed a sex by treatment interaction, $F(1, 146)=3.993$, $p < .05$, and group by treatment interaction, $F(2, 146)=3.411$, $p< .05$. The sex by treatment interaction revealed that treatment made a greater difference to female scores than it did to male scores (See Table 33, page 68). The presence of color appeared to lower the mean scores of female evaluation. The group by treatment interaction showed that treatment made a greater difference on grade four scores than it did on the scores of grade seven and grade 12 subjects (See Table 34, page 68). Grade twelve subjects rated the slide higher than grade four subjects who rated the black and white and color slides very "good", "happy", and "fair".

Table 33. Analysis of Variance, Means for Sex and Treatment of Slide Eleven for Evaluation Scores

	Sex		
Treatment	Male	Female	
Black and White	2.7652	2.4643	2.6147
Color	2.4074	2.8313	2.6194
	2.5863	2.6478	

Table 34. Analysis of Variance, Means for Group and Treatment of Slide Eleven for Evaluation Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	3.6199	2.5431	1.6812	2.6147
Color	3.2619	2.3407	2.2556	2.6194
	3.4409	2.4419	1.9684	

Males rated the slide more potent than females on the potency dimension, $F(1, 146)=12.312$, $p< .001$.

Treatment was a significant factor on the color dimension with the color slide being rated redder than the black and white slide, $F(1, 146)=7.348$, $p< .01$. Treatment was also an area where a trend

occurred on the activity dimension, $F(1,146)=3.864$, $p< .1$, ($p=.051$). The black and white slide was rated more active than the color slide.

An interesting occurrence appeared on this slide. It seems that color may be related to potency and positive evaluation. Subject matter that is positive in affective content may exhibit "better" qualities on all dimensions due to the color treatment. The reverse may hold true with negative affective content and the black and white medium. The trend of differences among grade four, grade 12 and grade seven scores was again reinforced on this slide.

Slide Twelve. This was also an abstract slide. It was a close-up of reflected color from an oil slick. Predominant colors were blue and red.

Group was a significant factor on evaluation, $F(2,146)=25.288$, $p< .001$. Grade four mean scores were significantly lower than grade seven and grade 12 means. Grade seven means were significantly larger than grade four means and significantly smaller than grade 12 means. Grade four subjects continued their consistency by rating the slide "better" than the other groups.

On the activity dimension, grade 12 means were significantly larger than grade seven and grade four subjects, $F(2,146)=8.387$, $p< .001$. A treatment effect on activity revealed that the color slide was more passive than the black and white slide, $F(1,146)=4.734$, $p< .05$.

A sex trend on activity demonstrated that female scores were

more passive than male scores, $F(1,146)=3.759$, $p < .1$ ($p=.055$). The group factor on the color dimension showed that the grade four subjects rated the slide redder than the grade seven and grade 12 subjects, $F(2,146)=4.942$, $p < .01$. Two-way analysis of variance on the color dimension showed a group by treatment interaction, $F(2,146)=4.398$, $p < .05$ (See Table 35).

Table 35. Analysis of Variance, Means for Group and Treatmen of Slide Twelve for Color Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	4.0483	3.9266	4.3373	4.1041
Color	4.8846	4.7473	3.0250	4.2190
	4.4665	4.3370	3.6812	

Treatment made a greater difference on grade four scores than it did on the grade 12 and grade seven subjects. Grade 12 subjects rated the color and black and white slides bluer than the grade seven and gradefour subjects. The grade four subjects rated the black and white slide blue and the color slide red.

Hypothesis number two again received support from this slide as did hypothesis one.

Slide Thirteen. A ghetto apartment was pictured in this slide.

The apartment was red brick with a bright blue sky. It was chosen due to its passive nature (5.589). Sex and group were significant factors on evaluation. Females rated the slide "worse" than the males, $F(1, 146)=7.391$, $p< .01$, possibly a sign of greater feeling of sadness. The grade four subject means were significantly lower than the grade 12 and grade seven subjects. The grade seven and grade 12 subjects therefore rated the slide "worse" than the grade four group. This evaluation also possibly demonstrated a greater degree of understanding and feeling by the older students or maybe a more negative reaction due to more life experiences.

Significant difference was noted in treatment on the activity dimension, $F(1, 146)=4.704$, $p< .05$. The black and white slide was rated more passive than the colored version. On the color dimension, sex and treatment were factors of significant differences. The female group rated the slide bluer than the males, $F(1.146)=4.810)$, $p< .05$. Black and white slides were rated more blue than the colored version, $F(1, 146)=6.361$, $p< .05$. A trend also appeared in group differences, $F(2, 146)=2.813$, $p< .1$ ($p=.064$). Grade four subjects rated the slide less blue than the grade 12 and grade seven subjects. The maturation factor was again reinforced by the ratings of this slide. Hypothesis two also received support.

Slide Fourteen. The final slide in the series was abstract in nature but was falsely identified many times as an egg. This fact

added reinforcement to the Winn,Schieman (1977) contention that students centre on the "thingness" of an object. The slide was chosen for its high activity, evaluation and potency means (5.125, 4.875, 5.964). Dominant coloration was orange, magenta and black. Sex, $F(1,146)=5.549$, $p< .05$, and treatment, $F(1,146)=14.484$, $p< .001$, were significant factors for evaluation. The female group continued to rate the color and black and white slides lower than the males, who rated them more "bad", "sad", and "unfair". The black and white slide was rated "worse" than the color slide. Two-way analysis of variance on the potency dimension revealed a significant group by treatment interaction, $F(2,146)=7.170$, $p< .001$. Treatment made a greater difference on grade four subjects than it did on grade 12 and grade seven subjects. The color slide was more potent than the black and white slide. This difference was likely due to the apparent disturbing nature of this slide (See Table 36, page 73).

A sex by group interaction on the potency dimension, $F(2.146)=3.678$, $p< .05$, revealed that sex had a greater effect on grade four scores than on grade seven and grade 12 scores. This again may be a result of the disturbing nature of this slide, or due to the fact that the maturation level of males and females comes closer to parallel as the age of the child increases.

Table 36. Analysis of Variance, Means for Group and Treatment of Slide Fourteen for Potency Scores

	Group			
Treatment	Grade 12	Grade 7	Grade 4	
Black and White	4.7047	4.6912	5.9154	5.1038
Color	4.6346	4.4011	3.9306	4.3221
	4.6697	4.5462	4.9230	

Table 37. Analysis of Variance, Means for Sex and Group of Slide Fourteen for Potency Scores

	Group			
Sex	Grade 12	Grade 7	Grade 4	
Male	4.0834	4.0239	3.5754	3.8942
Female	3.6619	3.8101	4.2648	3.9123
	3.8727	3.9170	3.9201	

Concrete Slides versus Abstract Slides

A comparison of the results found in individual slides classified as concrete or abstract, revealed interesting findings. A previous study by Winn and Everett (1978) found it difficult to generalize the effect of color on subjects on affective learning due to possible

overpowering influences of the subject matter in the slides. A look at the concrete slides in this study revealed the affective responses of the students to the slides; a comparison of the abstract results to the concrete results, clarified what factors the color dimension affected.

Concrete Slides

Slides two, four, five, seven, nine, 10 and 13 revealed some overall differences due to the "content" factor. In the evaluation, potency, activity and color dimensions, the slides revealed these findings:

1. Color was a major factor in differences in affective response to color and black and white slides. It had a greater effect on males in the study, showing more impulsive color slide ratings. This was interpreted as a less mature evaluation of the slides. Conversely, females were more cautious in their evaluation of both black and white and color slides; color appeared to cause more critical evaluation. The direction of evaluation by all subjects in the sample, depended on whether the content of the slides was designated positive or negative in the original selection procedure. Results from slides two, four, seven, 10 and 13 supported this point.
2. The potency of a slide also appeared to be affected by the maturation level of the child. Both males and grade four pupils rated concrete slides more potent than females, grade

seven subjects and grade 12 subjects. This trend appeared on slides two, five, seven and nine. The effect of color on potency appeared to correspond with positive or negative evaluation as did scores in other dimensions. Potency appeared to have a greater effect on female scores, especially on slides which may have induced fear.

3. The activity dimension appeared to be affected by color. Color slides which were rated "good" were also rated more active. The reverse was true for slides rated in a more serious manner. The colored slides were more passive than the black and white versions.

4. The results of the color dimension agreed with the previous study by Winn and Everett (1978). Color slides were rated red; black and white slides were rated blue. Slides which were rated red made the subjects feel "better", more active and "strong". Slides rated blue made the subjects feel "bad", passive and "weak".

Abstract Slides

The results of slides one, three, six, eight, 11, 12 and 14, indicated the color dimension had particular effects on the subjects. If the slide was originally rated "good" on the evaluation dimension, the color slide was rated "better" than the black and white slide. This suggested that color promoted more positive affective responses from positive content slides. The reverse result appeared for black and white slides; serious content slides were evaluated more negatively on the semantic scales.

Color also had an effect at different maturation levels and on sex. Color appeared to result in more critical scoring of affective responses by the more mature groups and subjects. This contention is supported by the consistently more critical appraisal of slides by both grade 12 subjects and females and by the vacillating response of the grade seven subjects. Color had a greater effect on female scores at the grade four level, but as the maturation of the sexes became closer to parallel at the grade 12 level, it was the group which was more affected by the treatment. In this case, color resulted in more critical appraisal of affective content. Addition or absence of color also resulted in a color slide being rated red or redder than black and white and black and white being rated blue or bluer than color. Males tended to rate slides red or redder than females.

The analysis of results of these slides clearly showed the color factor resulted in more critical appraisal of content by more mature subjects, which resulted in a lesser degree of affective feeling, or a more mature appraisal of affective feelings by the older and female subjects.

The Comparison

A comparison of the concrete and abstract slides therefore revealed that the content of individual pictures affected reaction in differing ways, but the treatment had the same impact on all slides. In other words, the content of a slide affected which direction the scores on the scales of each dimension fell (whether positive or negative)

but the treatment affected the degree of evaluation. Color appeared to affect more mature students; their appraisal was more critical. This was shown by scores of both grade 12 subjects and females whose reactions were usually in the same direction.

Thus, if the desired, immediate impact of a slide is more important than critical appraisal, the black and white slides appear to have more potency than color. The absence of color seems to enhance sericusly oriented content. Color, on the other hand, appears to enhance or reinforce the content of a slide of a positive nature as well as induce a sense of more critical appraisal.

Chapter 5

DISCUSSION AND CONCLUSIONS OF THE STUDY

Conclusions drawn from the data reported must be tempered with the obvious limitations of the study. Subjects were not completely randomly assigned and the sample size was somewhat small, although this was partially overcome by factors mentioned previously. It was felt that the selection of class groups was such that these effects were reduced. Also, in spite of extreme care in selection and screening of slides, it is evident from the results that color and black and white differences appear in individual slides and cannot always be generalized to the whole set. The results of the abstract and concrete slides appeared to eliminate some of the above problems. Bearing these limitations in mind, it is nonetheless possible to draw the following conclusions.

Effect of Maturation

The thorough analysis of the data revealed adequate support for hypothesis one. Significant differences among test scores in the group, sex, treatment and color dimensions occurred on 13 of the 14 slides. While these results occurred on differing dimensions for various slides, the trends are invariably in the same direction. Grade four subjects reacted in a different manner from grade 12 subjects when rating the same affective content. Their responses were always

more impulsive, rating slides either on lower or higher means than grade 12 subjects on the evaluation, potency, activity and color dimensions. Further support for these differences occurring on different dimensions is attributed to the pre-testing of the slides. The slides invariably showed significant differences on the same affective dimensions on which they were originally selected. This action occurred on 11 of the 14 slides on all dimensions of the original rating and on 13 of the 14 slides on at least one of the original ratings (some slides were selected for their highest or lowest means on more than one dimension). The fact that significant differences appeared, speaks for the high reliability of the slide selection process. This is especially important for the group and treatment factors, the main emphasis of the study, but the difference between maturation levels is also reinforced by the sex variable. A failure to achieve these differences would have resulted in rejection of the hypotheses, but there is sufficient and continued support for acceptance of both hypothesis one and two.

The major findings in this study revealed that affective content has significantly different effects on different age levels of children. The color factor also has a sufficient effect on different age levels, on sex, as well as on different dimensions of the semantic differential.

Difference in Affective Meaning Due to Maturation

It is apparent from the comprehensive analysis of data of the slides in the study that the affective meaning of a picture has a different impact at different age levels. Older students in the study reacted in a

less impulsive manner to the content of each slide than the younger students. On slides of a positive nature (slide three, four, eight, nine, 11), the grade four subjects always reacted in a more impulsive manner rating the slide "better", more potent, more active and more red. When slide content may have exhibited fear, such as in slides two and five, the reverse was true with the grade 12 subjects reacting more extremely than the grade four subjects. Content, therefore, was the determining factor for the reactions found on the data from some slides.

Significant differences on the evaluation dimension for group appeared on slides three, four, seven, eight, ten, 11, 12, and 13 as well as on the overall results. All instances showed the grade four subjects rating slides "better" than the grade 12 subjects. In three cases the grade four and grade seven subjects rated the slides "better" than grade 12 subjects and in the remaining cases, the grade seven subjects always rated "better" than the grade 12 subjects.

The potency of a picture affected the subjects in a different manner. Slides one, two and five displayed significant differences for group. These differences appeared to be related to the diversity of the content of the slides. If the content were of a positive nature, the grade four students rated the slide more potent, but slides of serious content (indicated by the original selection procedure), were rated least potent by the grade four subjects and more potent by the grade 12 students. The grade seven evaluation vacillated from the grade 12 and grade four levels on these slides. These differences may be attributed to different

life experiences of the older students.

Significant group differences on the activity dimension, on slides three, four, eight, ten and 12, always displayed the grade four and grade seven scores as being more or less active (depending on the content), than the grade 12 scores.

The color dimension also produced uniform effects on the grade four and grade 12 subjects. On slides four, seven and ten, and on total color, the grade four subjects always rated slides more red or less blue than the grade 12 subjects, again in relationship to individual slide subject matter. Overall, the grade 12 pupils rated the slides more blue than the grade seven and grade four subjects. Grade seven subjects' scores again vacillated between grade four and grade 12 scores on individual slides.

Differences in maturation between males and females were shown with males always scoring slides in a less mature manner than females. Another interesting note is the fact that this extreme in evaluation lessened significantly at the grade 12 level as the maturation level of males and females came closer to parallel.

Significant sex differences on slides two, seven, eight, 13 and 14 and total evaluation scores, disclosed that male subjects always rated slides "better" than female subjects. On slides where the content was rated "sad", the males reacted in a less "sad" manner, thereby continuing their "better" rating. The direction of male scores continued on the potency dimension. Male subjects always rated slides more

potent than females (see slides two, five, nine, 11 and total potency). Activity showed sex differences on slides four, eight, 12 and total activity. The male subjects continued their lower mean scoring, rating slides more active than female subjects. The color dimension affected the male subjects in the same manner. Male subjects always rated the slide redder or less blue than females (see slides seven, eight, and13).

The above results present strong evidence that maturation is not only a factor at differing age levels, but also within groups, between male and female subjects. Females always appear to react in a more reserved manner except in situations of strong emotion where they appear to exhibit greater feeling of fear, sadness, weakness and coldness. The difference of this feeling continues at all the grade levels tested but is most extreme at the grade four level. Is this finding a result of socialization or an innate quality of females? More studies in this direction appear to be necessary.

The scores of the grade seven subjects were more difficult to place in any pattern. The nature of each individual slide seemed to cause the scores of these subjects to vacillate between, or be in agreement with, either the grade four or grade twelve subjects. This vacillation appears to support the theories of development that have been presented in this thesis.

The Effect of Treatment on Affective Meaning

The results of this study emphasize the fact that color is more than purely a visual phenomenon. Whether a presentation is shown in

color or black and white will have a bearing on the affective responses of the observer. The results of all slides in this study have demonstrated that the presence or absence of color has an effect on the level of affective response by the subject. The abstract slides in this study have shown that color can enhance positive responses on positive content slides or decrease negative responses on seriously oriented content. Black and white can emphasize the meaning of a presentation of negative content while decreasing the response on positive content. It seems that color not only affects feelings by increasing "happiness", "activity" and "strongness", but it also appears to cause a more comprehensive evaluation. If these findings can be replicated by future studies, then it would be fair to assume that guidelines can be set for the use of color with cognitive content. If the initial reaction to a picture is of utmost importance to learning, then the black and white mode seems to be the better choice, but if the composite view of the subject matter is necessary, then color must be utilized.

Another factor for the use of color is related to maturation. If a presentation is to be shown to a younger audience, then more excitement and impulsive reactions can be attained from a color presentation. If more control on student response is desired, then black and white will achieve this end.

The treatment effect on the evaluation dimension revealed that the best mode to be used to express differing affective responses is dependent upon the content. Slides of a serious nature were rated

"worse" when appearing in black and white. The reverse seems true for positive content. Color slides were rated "better"(see slides one, two, eight and 14). A significant difference also appeared on slide four. In this case the black and white slide was rated "better". This was a picture of silverware which appeared more realistic on the black and white slide. It is apparent that this finding needs further investigation. Significant differences may not have shown on other slides in the study due to their original selection on other dimensions and because of the possible neutrality in these dimensions.

Throughout the study, slides which exhibited significance were always more potent in black and white than in color. Slides one, six, seven and total potency scores revealed this factor. The above slides appeared negative in subject content. Color therefore appears to lessen the potency of negative slides. A trend appeared on slide 11, which was originally chosen for its positive potency ratings. In this case, the color slide was more potent than the black and white slide. Although the support for this finding is weak, it follows trends found in treatment on other dimensions. Theoretically, it appears that color increases potency of positively rated slides and decreases potency of negatively rated slides.

The activity of slides is furtner affected by treatment. Activity appears to decrease with the addition of color. The results of slides one, seven, nine, 11, 12 and total activity scores, support this finding. Slide 13 reported the opposite finding. The black and white slide was more

passive. Content may have been a major factor for this difference.

Blue is the predominant feeling exhibited by black and white slides, whereas red is associated with color slides. Significant differences on slides three, eight, 11 and 13 and total color scores, support this view. The earlier study by Winn and Everett (1978) had the same finding.

Support from Two-Way Interaction

Two-way interaction between group and treatment, sex and treatment and sex and group, were found on all dimensions of the study. On the evaluation dimension, total scores, slide four, eight and 11 all revealed sex by treatment interactions. Overall treatment had a greater effect on the males which resulted in them rating color slides "better" than black and white slides. Results on individual slides varied with the content, but males always rated color slides "better", whereas females were more affected by treatment on slides four and 11, rating slides in a reverse manner than males. Sex by treatment interaction therefore appeared to have two different effects. Firstly, treatment had the greatest effect on males, resulting in color slides being rated "better" than black and white slides, whereas the difference was not that obvious within female scores. Secondly, the greater difference occurred in female scores due to opposite evaluation scores with females rating black and white slides "better" and males rating color slides "better". Conclusive inferences are therefore difficult to hypothesize from this data relating to male and female scoring.

Apparently males are more affected by the difference in treatment and that color makes them evaluate in a more positive manner; the female differences are more difficult to explain. The content of the individual slides was possibly the reason for this reversed finding as a sex by treatment interaction on the total abstract slides reinforces the notion that treatment had a greater effect on males.

Group by treatment interactions on evaluation occurred on slides one, four, six and eleven. Treatment appeared to have a greater effect on the younger students than it did on the grade 12 subjects. In two cases each, treatment had a greater effect on the grade four and grade seven subjects. In all cases, the grade four evaluations were "better" than those of the grade seven and grade 12 subjects. These findings added further support to both hypotheses one and two.

Sex by group interaction occurred on total evaluation scores and on slides two and five. In all instances, sex had the greatest effect on group at the grade four level. This difference was a result of male scoring. Male ratings were "better" and further apart between black and white and color treatments. Maturation differences between males and females were reinforced by the finding.

The potency dimension revealed group by treatment interactions on slides six, seven and fourteen. Treatment continued to result in greater differences in color and black and white ratings at the grade seven and grade four levels. Analysis of results continued to show more potent evaluation at the grade four level with treatment having

a greater effect on females. This too, could be attributed to content. The color slides were rated less potent than the black and white slides. It is therefore evident that maturation and the addition of color does affect the affective potency reactions of the subjects. Treatment has a greater impact at the grade four and grade seven levels and on females at all levels; the color addition to slides results in less potent evaluation.

Overall trends appeared in the activity dimension for group by treatment. These findings suggest that treatment had a greater effect on grade 12 students resulting in their rating black and white slides significantly different from the color slides (black and white were more active). The differences were not as great at the other levels. This revealed that color decreases the activity of a slide at the grade 12 level.

Two-way interactions on the color dimension for group by treatment occurred only on slide twelve. The greatest effect was at the grade four level. The difference was attributed to the grade four subjects scoring the black and white slide blue and the color slide red, whereas the other groups evaluated in a reverse manner with no significant differences occurring between treatment. That treatment on the color dimension has a greater effect at the grade four level can only be suggested.

Sex by treatment interactions appeared to show stronger support. Total color scores, total concrete scores, slide two, four and eight revealed sex by treatment differences. In four of the five cases,

treatment had a greater effect on male subjects. The males rated black and white slides blue and the color slides red, while the females rated both black and white and color slides either blue or red depending on the content of the slide. It can therefore be stated that the color treatment will result in "red" affective responses and the black and white treatment will result in "blue" affective responses. These responses will have greater effects on the males than on the females.

The overall findings of this thesis, therefore, lend support to both hypothesies one and two. There is a definite difference in the effect color has on pupils at different maturation levels. Older students appear to have less impulsive feelings when evaluating colored content. Their reactions are not as extreme as younger students' reactions. Further testing needs to be performed on the reasons for this reserved evaluation. This may lead to the conclusion that color stimulates greater comprehension in older subjects than does black and white. Findings in cognitive studies indicating that color added too much information may be near-sighted, as the strong emotional impact of the content may not have been expressed in cognitive test scores. Previous studies on cognition, comparing black and white and color treatments, may have found no significant differences due to the absence of measures by which subjects could register affective responses to the study materials. Modern computer testing methods and multiple choice examinations have virtually eliminated expressiveness and creativity. This study has shown that color is an important attribute of affective

responsiveness. Further studies are therefore important to test the correlation of these findings with cognitive learning.

Conclusions

The results of this study permit the following conclusions.

1. Treatment has a different impact on students of different age levels. Grade 12 subjects react in a more conservative manner when recording affective feelings whereas grade four subjects react in an impulsive manner. Grade seven pupils vacillate between these extremes.

2. Treatment has a greater impact on less mature students and upon males at all levels of the study. Color slides have their greatest impact at the grade four level.

3. Treatment has an effect on affective responses in the evaluation, potency, activity and color dimensions. Color results in more impulsive evaluation ratings by grade four subjects, a decrease in activity ratings at all levels, a decrease in potency ratings, and the tendency to rate color slides red on the color dimension. Black and white slides result in the grade 12 subjects rating at a more active level on the activity dimension.

4. The affective content of a picture affects the direction, whether positive or negative, where responses will be recorded, but the addition or absence of color affects the degree of appraisal.

5. Positive content elicits stronger affective responses from color pictures.

6. Serious content elicits stronger affective responses from black and white pictures.

7. Female subjects exhibit higher mean scores on slides of negative content signifying a more emotional reaction than male subjects.

8 Slides rated red are also rated "better", more potent, and more active whereas slides rated blue are rated "worse", less potent and less active.

9. Students of different maturation levels associate redness with 'goodness', activity and 'strongness', whereas blueness is equated with "badness", passivity and "weakness".

10. The evaluation of affective content of color and black and white slides by students is directly related to their maturation level. More mature students react in a less impulsive manner, rating slides less "good" or "bad", less potent, less active, and more blue.

Practical Application

The findings of this scientific study reveal for the educator, what many artists appear to have discovered by chance long ago. The power of color or its absence can be found in the works of many great artists in a variety of media. This study has resulted in an exposure of techniques used by these professionals to induce affective responses in the art medium.

The study has also shown how individuals of different maturation levels will react to the same information. It is clear that younger pupils react in a more impulsive manner than older pupils and that males react more in this manner than females, but this study also shows something of society. Maturation is equated with reservation of expression of feeling. This is a sad finding as it shows the confinement and suppression of the individual as he/she ages. The spontaneity and excitement of the younger pupils in the study was exhilarating to the author. The findings of this thesis may be the key to continuing this expressiveness in older pupils.

The educational designer of curricula can do much to stimulate feeling in education. Walt Disney movies manifest the utilization

of color and black and white visual effects to initiate affective responses at all age levels. Recall the scene in "Bambi" where Bambi fights for his mate. In this scene there is an almost total absence of color. The figures are silhouetted in black with the occasional red highlight flashing throughout the scene. This is a masterful piece of art incorporating both the powers of black and white (fear) and the excitement of color (red). How often has the loneliness of a black and white photograph or painting been portrayed by pictures of people in shadows? The lack of color enhances this feeling of loneliness. On the other hand, the vibrance and excitement of life is captured through the color medium in the photograph of a newborn baby. The educator can use these techniques to bring the curricula alive. Subject matter in English and Social Studies can be enhanced by choosing the proper medium. Imagine the lasting impressions of a Shakespearean play in black and white. The simplicity of the stage settings demand this starkness. The lack of color augments the dialogue whereas color may distract or distort the dialogue. A film on the customs of African tribes would be more effective in color.

There is no doubt that color or black and white media must be utilized by educators according to the evidence accumulated in this study. It is reasonable to assume that careful selection of affective media will also be rewarded by an increase in student cognition.

The findings of this study support the need for further study into the correlation of affective and cognitive meaning from content.

A true picture of the effects of mediated instruction will not be complete without this research. Further studies are also necessary to support the findings of this thesis in addition to refining and defining the effects of maturation on affective learning.

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APPENDICES

APPENDIX A

RESEARCH MATERIALS

Grade _____ Male_____ Female _____

Please write the number that appears on each slide — if no number appears, respond with an "X".

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

12.

13.

NOTE: It is important that you place an "X" exactly in the middle of the square you choose to mark. You will be given 45 seconds to view and make responses to each slide. You must complete each pair of scales. Do not look at anyone else's answers.

Details of the Semantic Differential Scale Sheets and General Instructions

Each student was given a booklet of 14 identical sheets of semantic differential scales. A sample can be found on page 102. The scales were assigned numeric values according to methodology devised by Osgood et al (1957) with ratings from one to seven with a mean of four. Scales drawn from a single dimension were alternated in polarity. Instructions included:

1. general orientation to task
2. the significances of the scale positions and how to mark them (no omissions, marking with "X" in the centre of the space chosen)
3. attitude toward the task (speed, first impressions, independence of judgements).

Good	☐ ☐ ☐ ☐ ☐ ☐ ☐	Bad
Sad	☐ ☐ ☐ ☐ ☐ ☐ ☐	Happy
Blue	☐ ☐ ☐ ☐ ☐ ☐ ☐	Red
Slow	☐ ☐ ☐ ☐ ☐ ☐ ☐	Fast
Heavy	☐ ☐ ☐ ☐ ☐ ☐ ☐	Light
Restless	☐ ☐ ☐ ☐ ☐ ☐ ☐	Quiet
Large	☐ ☐ ☐ ☐ ☐ ☐ ☐	Small
Hot	☐ ☐ ☐ ☐ ☐ ☐ ☐	Cold
Unfair	☐ ☐ ☐ ☐ ☐ ☐ ☐	Fair
Strong	☐ ☐ ☐ ☐ ☐ ☐ ☐	Weak